ABSTRACT

The present invention provides surface plasmon resonance (SPR) sensors comprising a sensor chip constructed of laterally integrated arrays of planar sensor chip units and an optical transducer constructed of laterally integrated arrays of planar optical transducer units. The replaceable sensor chip is separated from the optical transducer by a gap and with perpendicular optical interconnections between the sensor chip and the optical transducer. Focusing and collimating optics and sensing areas are integrated on the same sensor chip, whilst the optical interconnections between the sensor chip and the optical transducer are based on collimated light beams incident perpendicular to the interfaces. This implies an uncritical alignment of the optical transducer and the sensor chip. The direction of the light beams will not be changed when passing through the interfaces between the sensor chip, the gap and the optical transducer eliminating the need of disposing refractive index matching gels in the gap. The configurations of the present invention provide SPR sensors with a number of sensing areas on the same sensor chip.

Sensors of this invention include configurations, where a monochromatic collimated light beam is emitted from each optical transducer unit. The light beam enters the corresponding sensor chip unit, where it is cylindrically focused onto a line on a metal film supporting surface plasmon waves underneath one or more sensing areas with angular bands covering the surface plasmon resonance angle. The focusing optics comprises a combination of a reflective diffractive optical element on the topside surface and an optional planar mirror on the backside surface of the sensor chip unit. Identical optics, but symmetrically positioned with respect to the sensing area, transforms the light output from the sensor chip unit into a re-collimated light beam that re-enters the optical transducer unit, where the light beam is imaged onto a detector array.